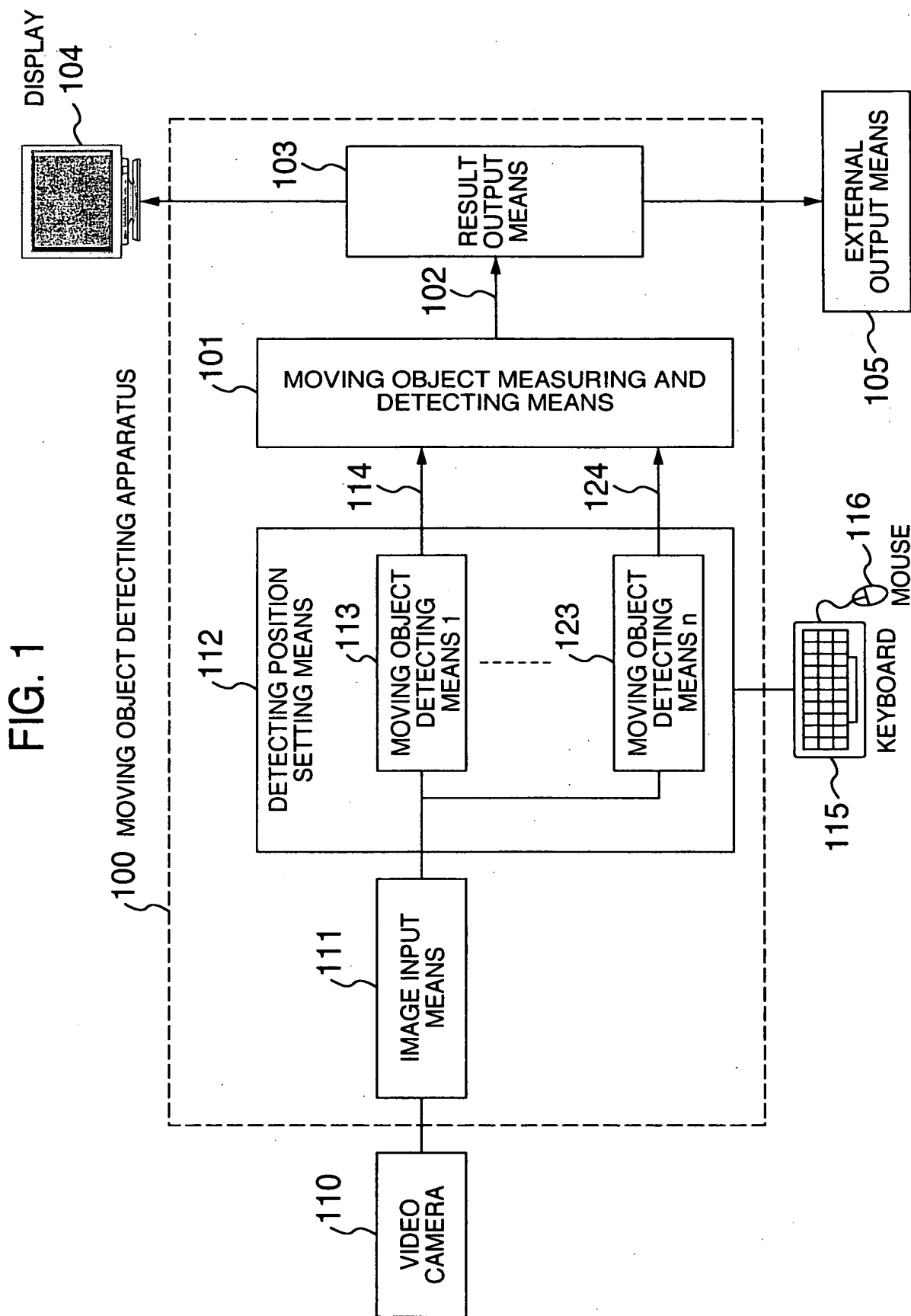Robert C. Colwell, Reg. No. 27,431   (650) 326-2400
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Atty Docket No. 16869S-030500
Sheet 1 of 15

FIG. 1

100 MOVING OBJECT DETECTING APPARATUS

DISPLAY 104

103

102 — RESULT OUTPUT MEANS

101 — MOVING OBJECT MEASURING AND DETECTING MEANS

112 — DETECTING POSITION SETTING MEANS

114

113 — MOVING OBJECT DETECTING MEANS 1

123

124

MOVING OBJECT DETECTING MEANS n

111 — IMAGE INPUT MEANS

110 — VIDEO CAMERA

105 — EXTERNAL OUTPUT MEANS

115 — KEYBOARD

116 — MOUSE

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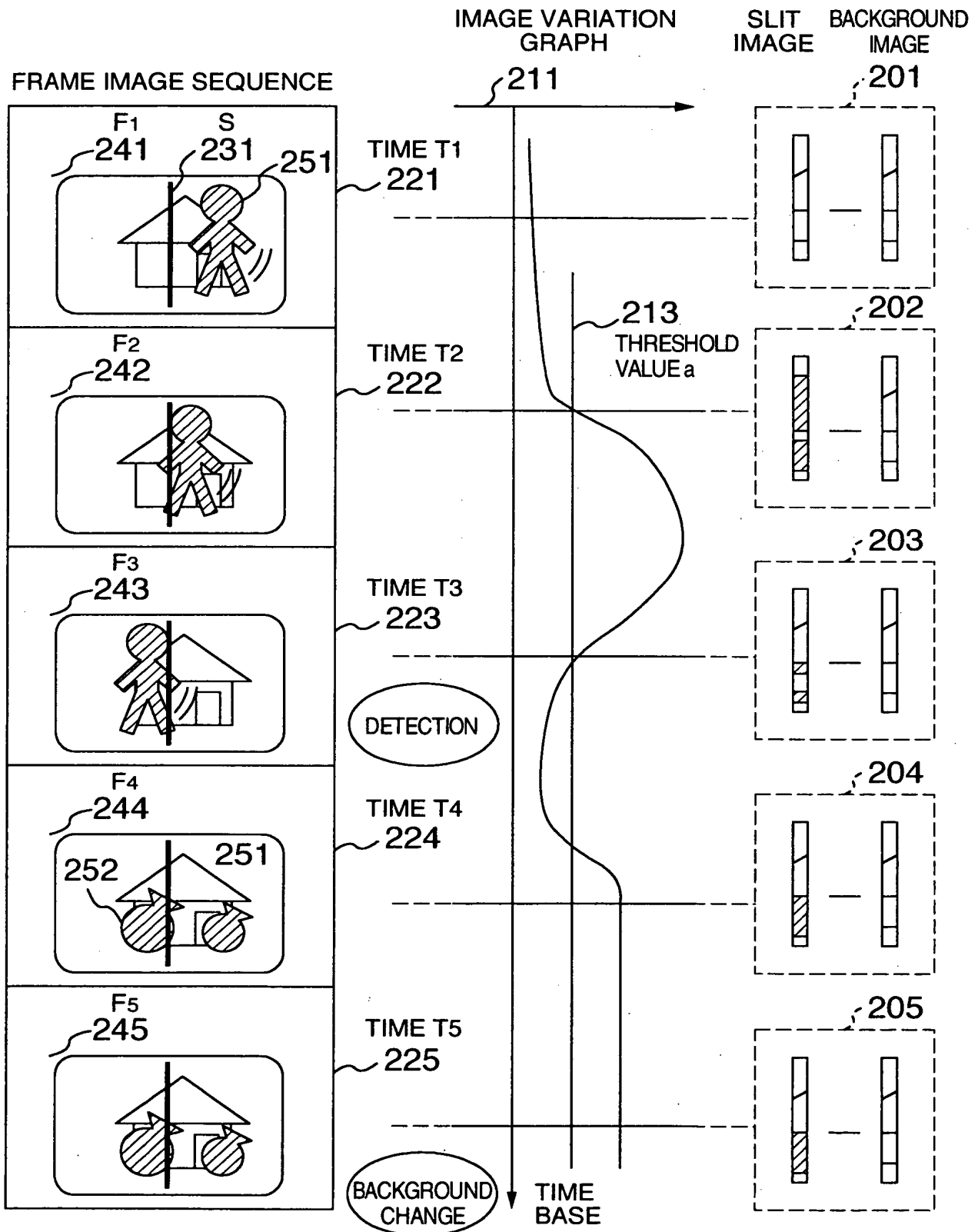**Atty Docket No.** 16869S-030500
Sheet 2 of 15

FIG. 2

IMAGE VARIATION
GRAPH

SLIT
IMAGE

BACKGROUND
IMAGE

FRAME IMAGE SEQUENCE

211

201

F₁   S
241   231   251

TIME T1
221

213
THRESHOLD
VALUE a

F₂
242

TIME T2
222

202

F₃
243

TIME T3
223

203

DETECTION

F₄
244

252   251

TIME T4
224

204

F₅
245

TIME T5
225

205

BACKGROUND
CHANGE

TIME
BASE

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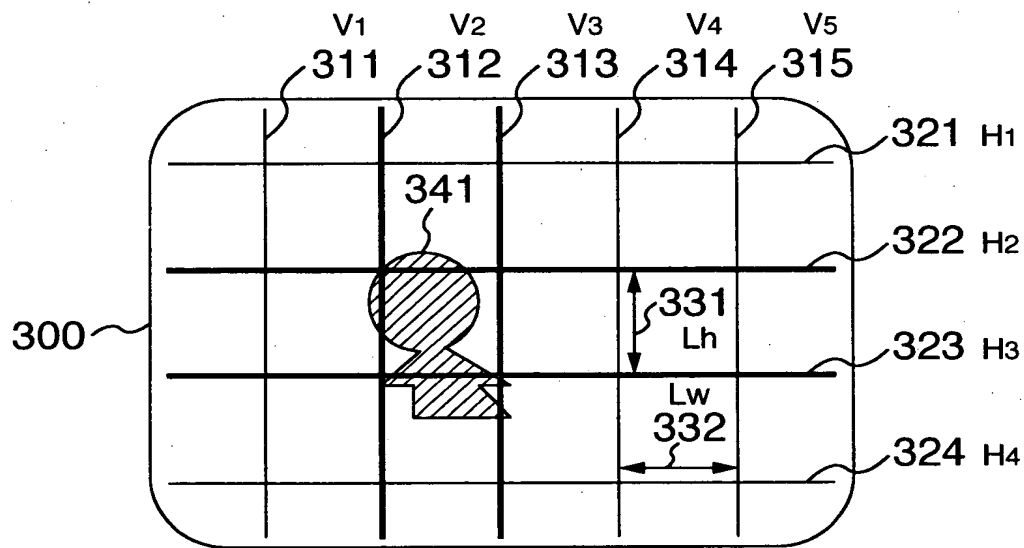**Atty Docket No.** 16869S-030500
Sheet 3 of 15

FIG. 3

V1   V2   V3   V4   V5
311   312   313   314   315

321 H1

341

322 H2

331
Lh

300

323 H3

Lw
332

324 H4

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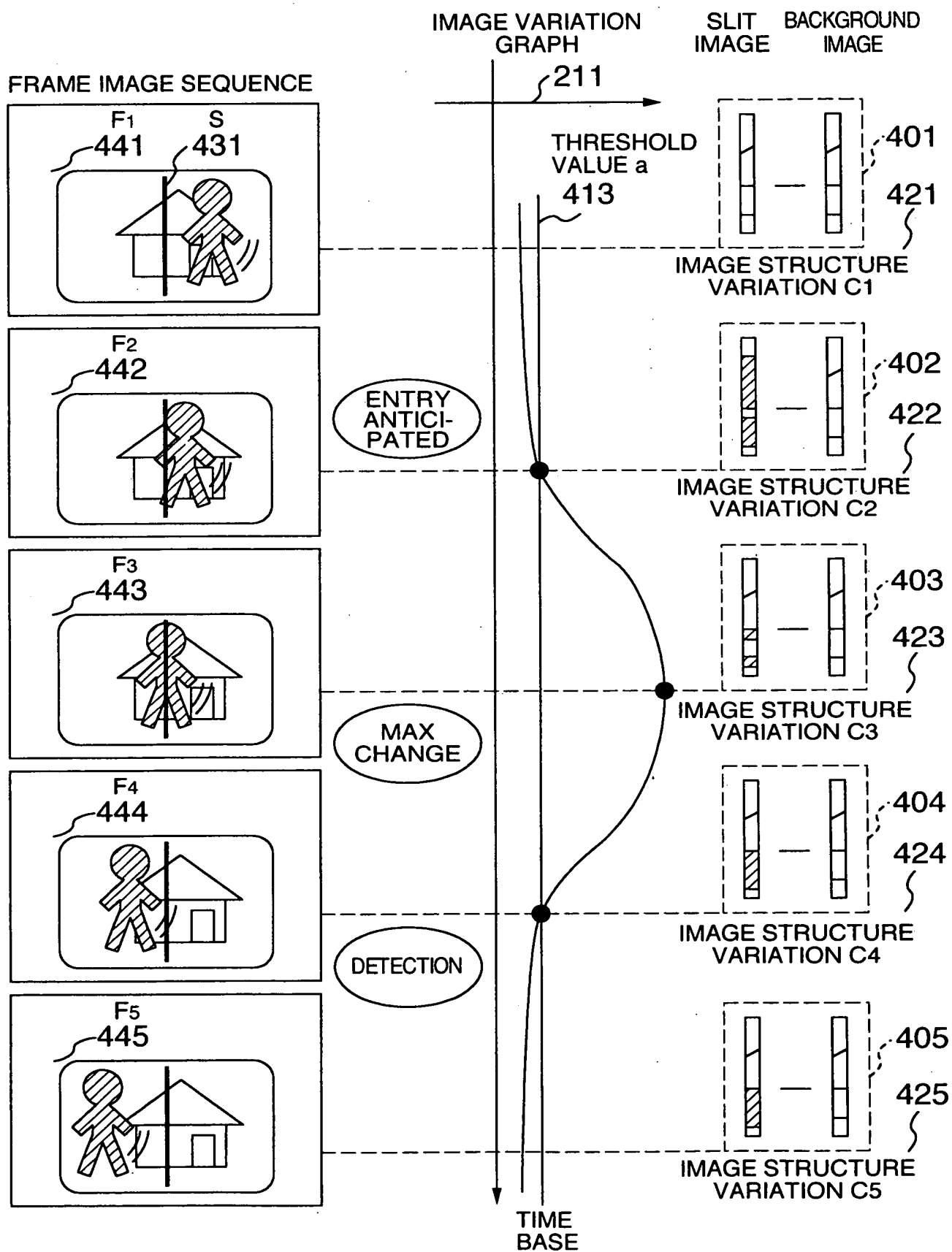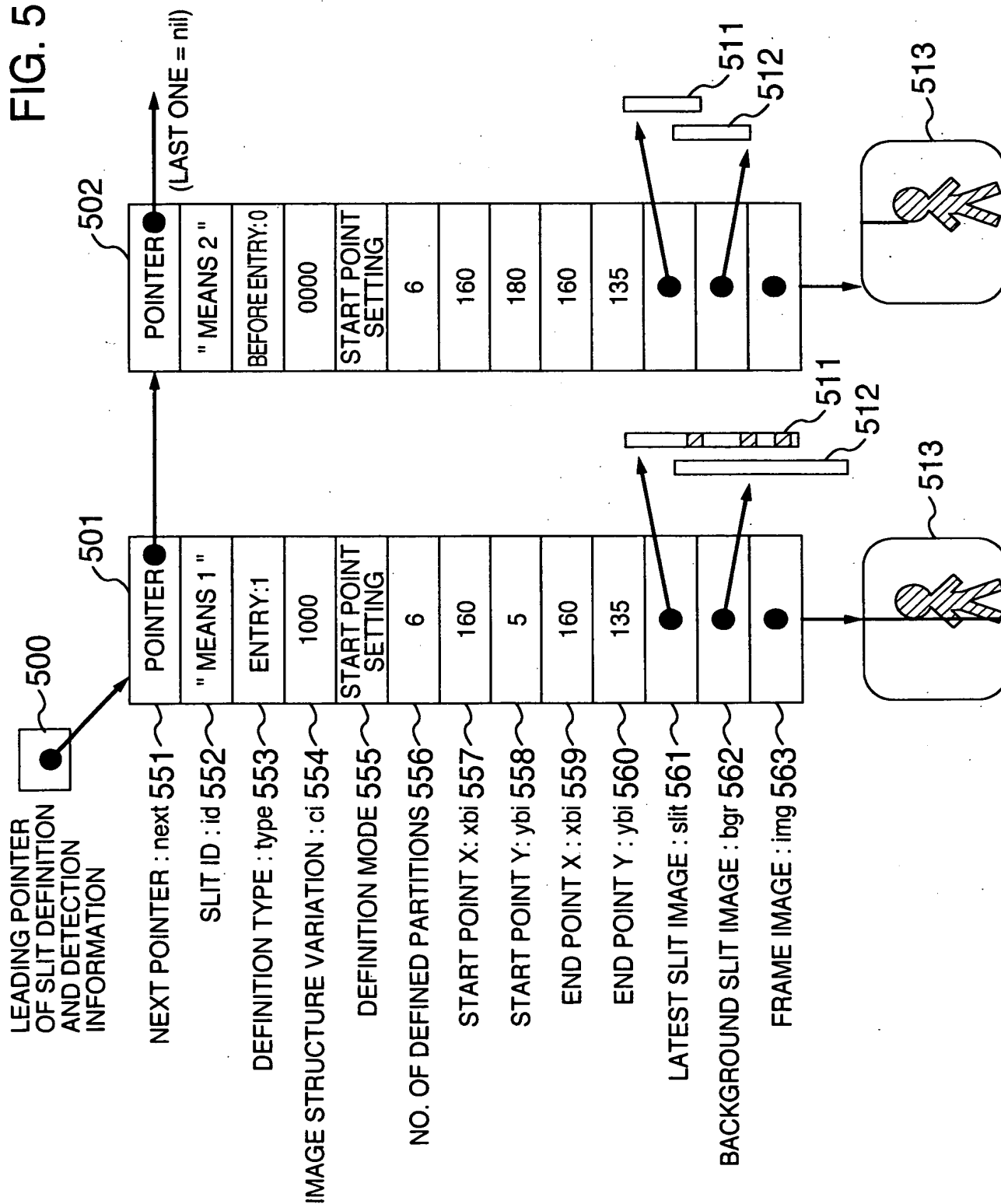**Atty Docket No.** 16869S-030500
Sheet 4 of 15

FIG. 4

IMAGE VARIATION
GRAPH

SLIT
IMAGE

BACKGROUND
IMAGE

FRAME IMAGE SEQUENCE

211

THRESHOLD
VALUE a
413

F_1 S
441   431

401

421

IMAGE STRUCTURE
VARIATION C1

F_2
442

ENTRY
ANTICI-
PATED

402

422

IMAGE STRUCTURE
VARIATION C2

F_3
443

MAX
CHANGE

403

423

IMAGE STRUCTURE
VARIATION C3

F_4
444

DETECTION

404

424

IMAGE STRUCTURE
VARIATION C4

F_5
445

405

425

IMAGE STRUCTURE
VARIATION C5

TIME
BASE

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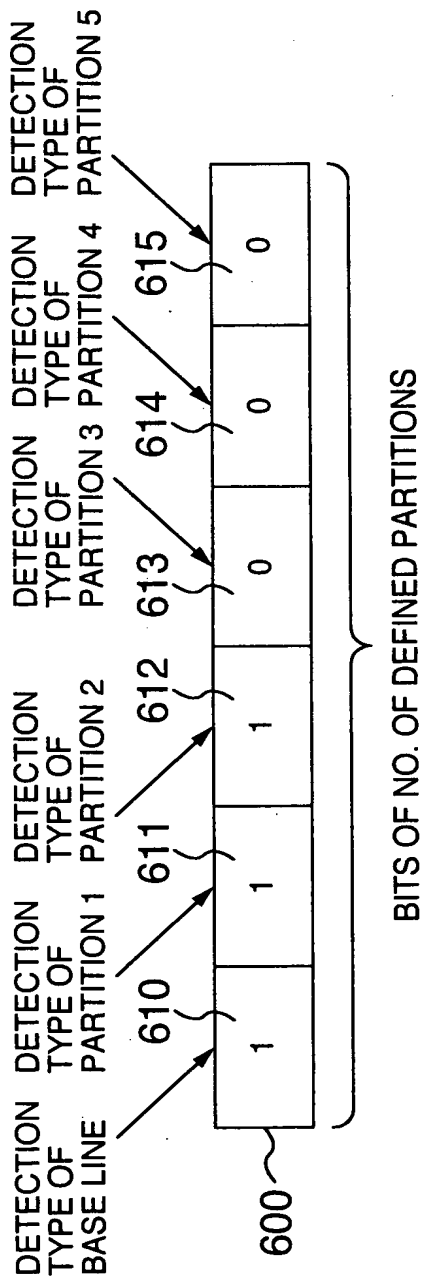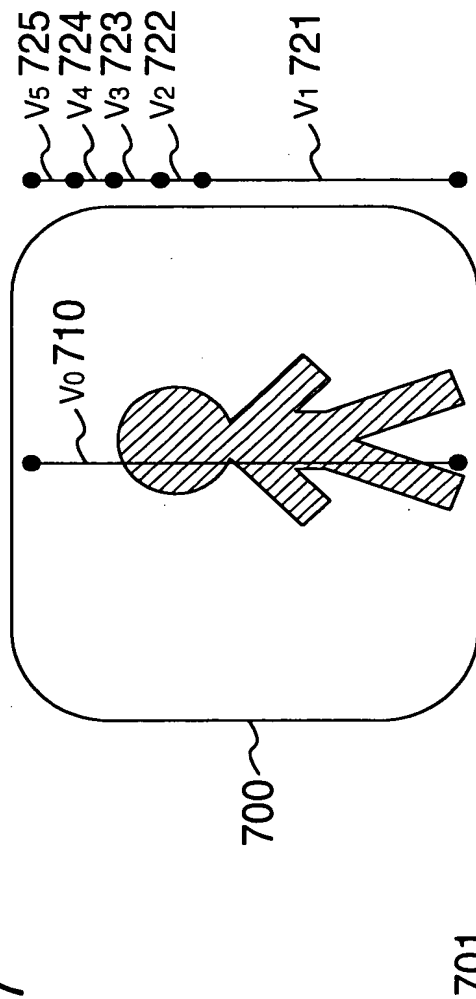**Sheet 5 of 15**

FIG. 5

LEADING POINTER OF SLIT DEFINITION AND DETECTION INFORMATION — 500

NEXT POINTER : next 551
SLIT ID : id 552
DEFINITION TYPE : type 553
IMAGE STRUCTURE VARIATION : c_i 554
DEFINITION MODE 555
NO. OF DEFINED PARTITIONS 556
START POINT X: x_{bi} 557
START POINT Y: y_{bi} 558
END POINT X : x_{bi} 559
END POINT Y : y_{bi} 560
LATEST SLIT IMAGE : slit 561
BACKGROUND SLIT IMAGE : bgr 562
FRAME IMAGE : img 563

Block 501:
POINTER
"MEANS 1"
ENTRY:1
1000
START POINT SETTING
6
160
5
160
135

Block 502:
POINTER → (LAST ONE = nil)
"MEANS 2"
BEFORE ENTRY:0
0000
START POINT SETTING
6
160
180
160
135

511
512
513

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: Method of Detecting and Measuring a Moving Ob~~~and...
Atty Docket No. 16869S-030500
Sheet 6 of 15

FIG. 6

DETECTION TYPE OF BASE LINE

DETECTION TYPE OF PARTITION 1

DETECTION TYPE OF PARTITION 2

DETECTION TYPE OF PARTITION 3

DETECTION TYPE OF PARTITION 4

DETECTION TYPE OF PARTITION 5

610

611

612

613

614

615

| 1 | 1 | 1 | 0 | 0 | 0 |

600

BITS OF NO. OF DEFINED PARTITIONS

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Method of Detecting and Measuring a Moving Obje●d...
Atty Docket No. 16869S-030500
Sheet 7 of 15

FIG. 7

SLIT NO.	DEFINED RANGE	HEIGHT INFORMATION					
		BEFORE PASSING	UNDER 1.6m	1.6m~ UNDER 1.7m	1.7m~ UNDER 1.8m	1.8m~ UNDER 1.9m	1.9m AND OVER
V0	0.0~2.0m	0	1	1	1	1	1
V1	0.0~1.6m	0	1	1	1	1	1
V2	1.6~1.7m	0	0	1	1	1	1
V3	1.7~1.8m	0	0	0	1	1	1
V4	1.8~1.9m	0	0	0	0	1	1
V5	1.9~2.0m	0	0	0	0	0	1
MEASUREMENT CODE		000000	110000	111000	111100	111110	111111

0 : BEFORE ENTRY   1 : ENTRY

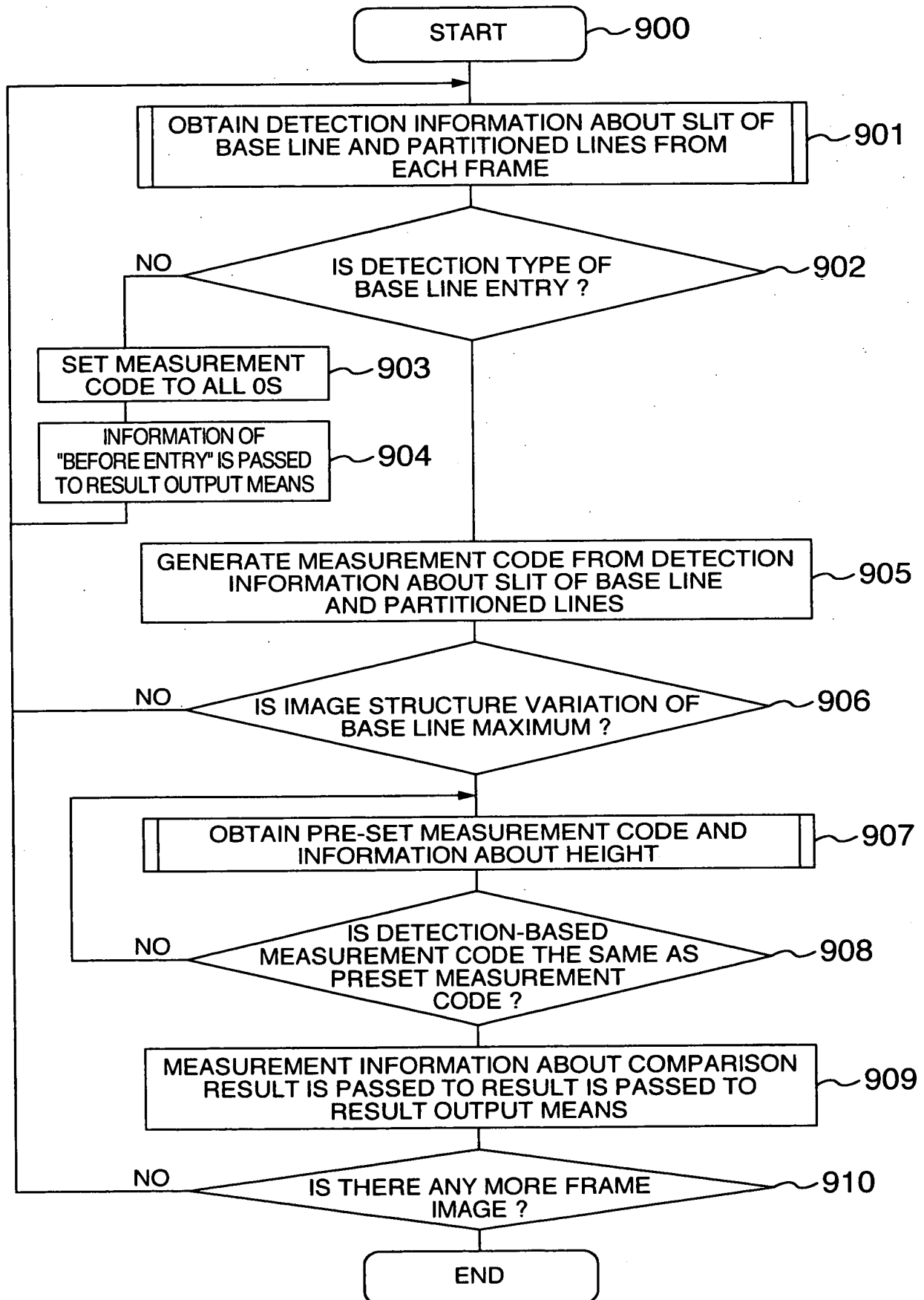Robert C. Colwell, Reg. No. 27,431   (650) 326-2400
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Sheet 8 of 15

FIG. 8
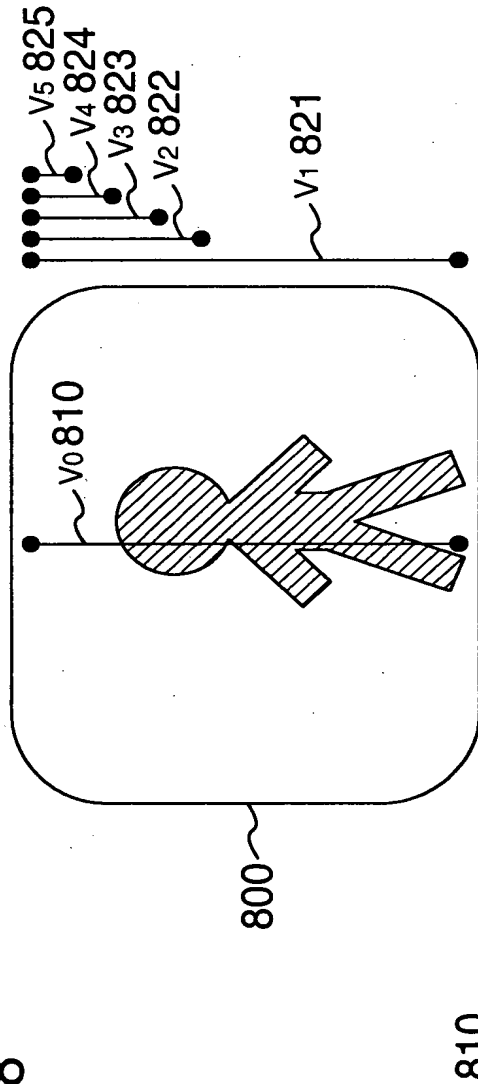
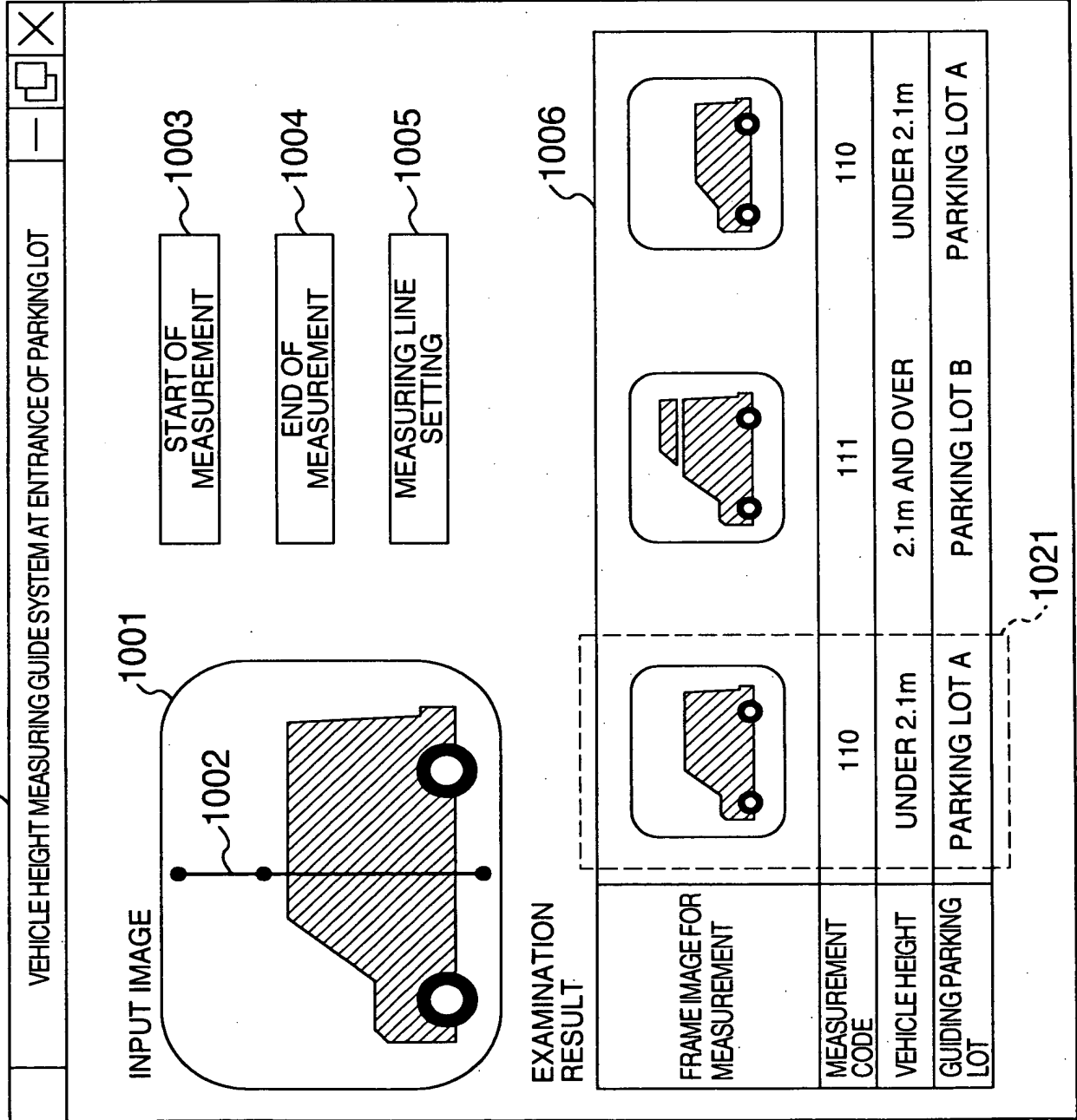| SLIT NO.	DEFINED RANGE	HEIGHT INFORMATION					
		BEFORE PASSING	UNDER 1.6m	1.6m~ UNDER 1.7m	1.7m~ UNDER 1.8m	1.8m~ UNDER 1.9m	1.9m AND OVER
V0	0.0~2.0m	0	1	1	1	1	1
V1	0.0~2.0m	0	1	1	1	1	1
V2	1.6~2.0m	0	0	1	1	1	1
V3	1.7~2.0m	0	0	0	1	1	1
V4	1.8~2.0m	0	0	0	0	1	1
V5	1.9~2.0m	0	0	0	0	0	1
MEASUREMENT CODE		000000	110000	111000	111100	111110	111111

0 : BEFORE ENTRY   1 : ENTRY

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: Method of Detecting and Measuring a Moving Ob   and...
Atty Docket No. 16869S-030500
Sheet 9 of 15

FIG. 9

START ～900

OBTAIN DETECTION INFORMATION ABOUT SLIT OF BASE LINE AND PARTITIONED LINES FROM EACH FRAME ～901

IS DETECTION TYPE OF BASE LINE ENTRY ? ～902

NO

SET MEASUREMENT CODE TO ALL 0S ～903

INFORMATION OF "BEFORE ENTRY" IS PASSED TO RESULT OUTPUT MEANS ～904

GENERATE MEASUREMENT CODE FROM DETECTION INFORMATION ABOUT SLIT OF BASE LINE AND PARTITIONED LINES ～905

IS IMAGE STRUCTURE VARIATION OF BASE LINE MAXIMUM ? ～906

NO

OBTAIN PRE-SET MEASUREMENT CODE AND INFORMATION ABOUT HEIGHT ～907

IS DETECTION-BASED MEASUREMENT CODE THE SAME AS PRESET MEASUREMENT CODE ? ～908

NO

MEASUREMENT INFORMATION ABOUT COMPARISON RESULT IS PASSED TO RESULT IS PASSED TO RESULT OUTPUT MEANS ～909

IS THERE ANY MORE FRAME IMAGE ? ～910

NO

END

FIG. 10

VEHICLE HEIGHT MEASURING GUIDE SYSTEM AT ENTRANCE OF PARKING LOT — 1000

INPUT IMAGE

1001

1002

START OF MEASUREMENT — 1003

END OF MEASUREMENT — 1004

MEASURING LINE SETTING — 1005

1006

EXAMINATION RESULT

1021

FRAME IMAGE FOR MEASUREMENT		
MEASUREMENT CODE	110	111	110
VEHICLE HEIGHT	UNDER 2.1m	2.1m AND OVER	UNDER 2.1m
GUIDING PARKING LOT	PARKING LOT A	PARKING LOT B	PARKING LOT A

FIG. 11

MEASURING LINE DEFINITION — 1100

DEFINITION MODE: — 1106
● PARTING POINT SETTING
○ START POINT SETTING

DEFINITION IMAGE — 1104 — 1101 — 1105 — 1102 — 1103

BASE LINE-0 SLIT POSITION SETTING: — 1107
START xb0 160   START yb0 005
END xe0 160   END ye0 235

BASE LINE-1 SLIT POSITION SETTING: — 1108
START xb1 160   START yb1 005
END xe1 160   END ye1 210

BASE LINE-2 SLIT POSITION SETTING: — 1109
START xb2 160   START yb2 210
END xe2 160   END ye2 235

DEFINING CONDITIONS: — 1110
MEASUREMENT CODE | VEHICLE HEIGHT | DESIGNATED PARKING LOT
110 : UNDER 2.1m → PARKING LOT A
111 : 2.1m AND OVER → PARKING LOT B

OK — 1111   CANCEL — 1112

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Atty Docket No. 16869S-030500

Sheet 12 of 15

FIG. 12

1200

MEASURING LINE DEFINITION

DEFINITION IMAGE 1204

1201

1205

1202

1203

1206

DEFINITION MODE:

○ PARTING POINT SETTING

◉ START POINT SETTING

1207

BASE LINE-0 SLIT POSITION SETTING:

| START xb0 | 160 | START yb0 | 005 |
| END xe0 | 160 | END ye0 | 235 |

1208

BASE LINE-1 SLIT POSITION SETTING:

| START xb1 | 160 | START yb1 | 005 |
| END xe1 | 160 | END ye1 | 235 |

1209

BASE LINE-2 SLIT POSITION SETTING:

| START xb2 | 160 | START yb2 | 210 |
| END xe2 | 160 | END ye2 | 235 |

DEFINING CONDITIONS:

1210

MEASURE-MENT CODE		VEHICLE HEIGHT		DESIGNATED PARKING LOT
110	:	UNDER 2.1m	→	PARKING LOT A
111	:	2.1m AND OVER	→	PARKING LOT B

OK　1211

CANCEL　1212

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Atty Docket No. 16869S-030500
Sheet 13 of 15

FIG. 13A
SLIT

P1 ---- PN :
ILLUMINATION OF EACH IMAGE

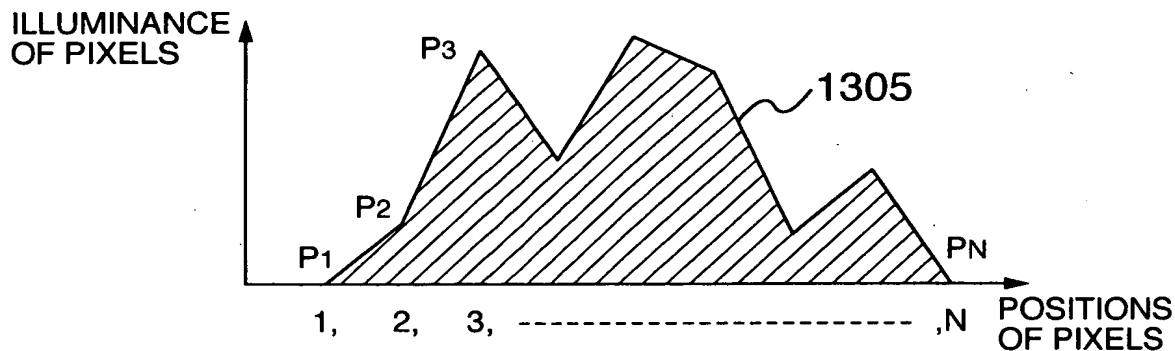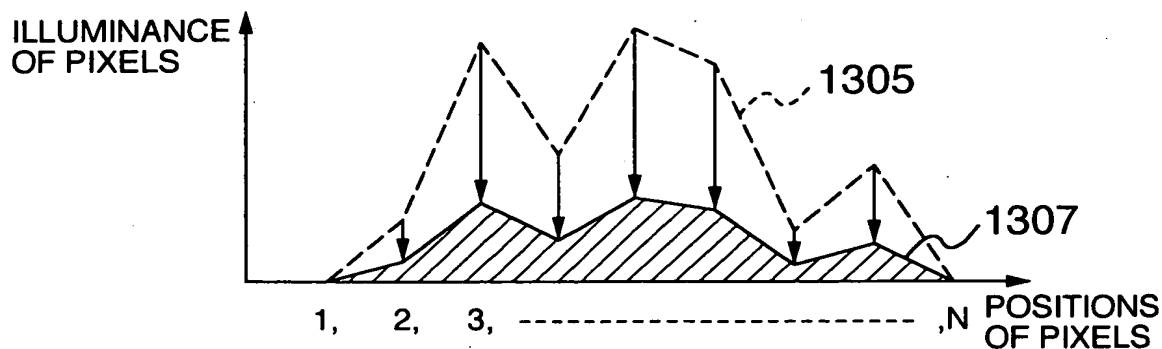| P1	P2	P3						PN

~1301

1,   2,   3, ------------------------- ,N
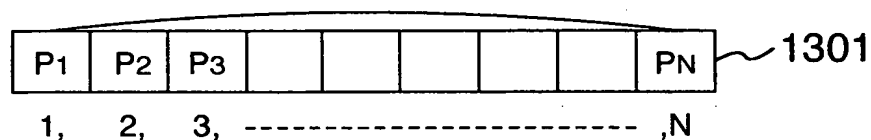
FIG. 13B
BACKGROUND SLIT

ILLUMINANCE
OF PIXELS

P3

1305

P2

P1   PN

1,   2,   3, ------------------------- ,N   POSITIONS
OF PIXELS

FIG. 13C

CHANGES IN SLIT PROFILE WHEN THE IMAGE IS
DARKENED BY SHADOW OR THE LIKE

ILLUMINANCE
OF PIXELS

1305

1307

1,   2,   3, ------------------------- ,N   POSITIONS
OF PIXELS

FIG. 14A   SLIT IMAGE EXPRESSED BY VECTOR NOTATION

$$V = (P_1, P_2, P_3 \cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots , P_N)$$
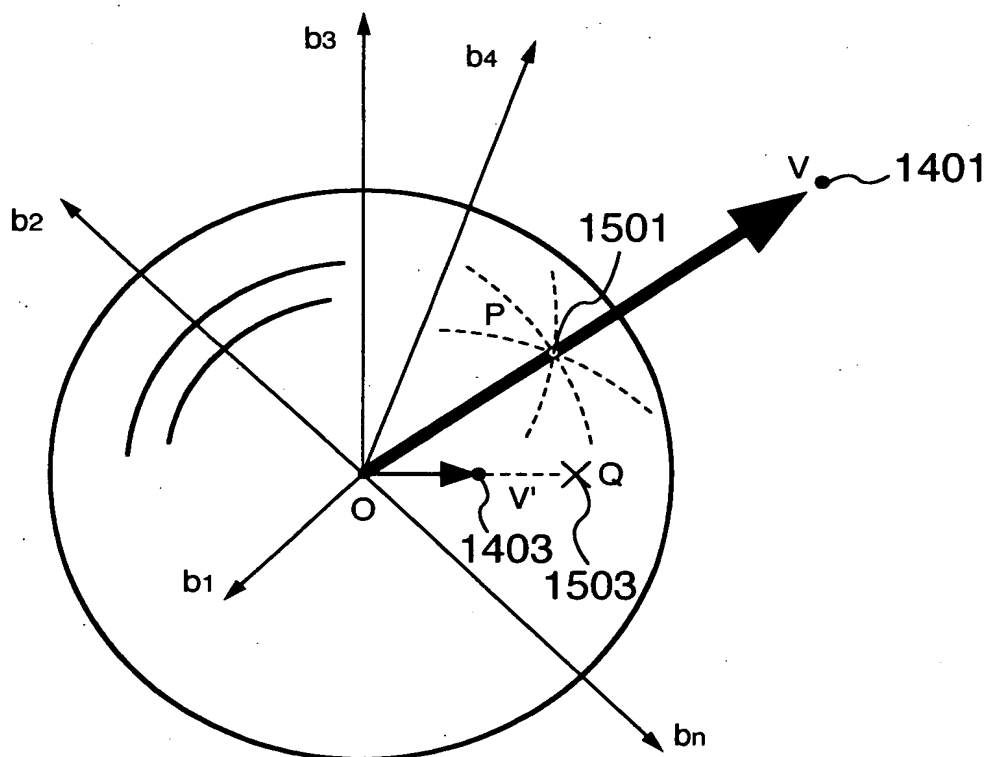
1401

FIG. 14B   SLIT IN VECTOR SPACE

b1··· bn : BASE VECTORS
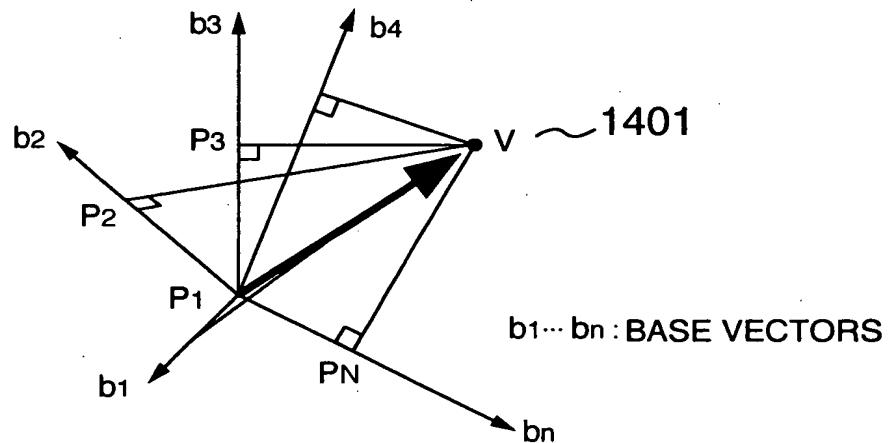
FIG. 14C   CHANGES IN SLIT VECTORS WHEN THE IMAGE IS DARKENED BY SHADOW OR LIKE

1401

V' 1403

FORMED AS A RESULT OF A CHANGE IN ILLUMINANCE IN V

FIG. 15